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Jeffrey Pine Beetle, *Dendroctonus jeffreyi* (Coleoptera: Scolytidae), Suppression, Sherwin Creek Campground, Mammoth District, Inyo National Forest

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Healthy Forests Make A World Of Difference

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Background

Sherwin Creek Campground (Figure 1) is located about 2 miles southeast of the Town of Mammoth Lakes on Sherwin Creek Road (Forest Road 4S08). The campground covers 30 acres and includes 72 vehicle accessible family camp sites and 15 walk-in sites. There is a day-use picnic area on Sherwin Creek just to the west of the campground. Jeffrey pine dominates the coniferous vegetation in the area with lesser amounts of lodgepole pine, white fir and western juniper. Aspen and willow are found in riparian areas along Sherwin Creek. Most of the coniferous stand is 80 to 110 years old and 60 to 100 feet in height. Current stocking levels average 200 to 260 sq. ft. of basal area per acre with a Stand Density Index (SDI) of 375. The desired stand basal area is 120 to 150 sq. ft. per acre with a desired SDI of about 230.

On September 27, 2001, Mammoth District personnel discovered several dead Jeffrey pine during a hazard tree survey in Sherwin Creek Campground. Further examination detected a number of Jeffrey pine with green crowns currently infested with the Jeffrey pine beetle (JPB) *Dendroctonus jeffreyi* (Coleoptera: Scolytidae). A description of JPB biology is attached below.

Survey

The Mammoth District and Forest Health Protection conducted a complete survey of the campground and surrounding area totaling 41.9 acres on October 2-4, 2001. The survey resulted in the identification of 63 dead Jeffrey pine. Of these; 1) 24 were currently infested with the 2001-2002 JPB generation; 2) 34 were killed by the 2000-2001 JPB generation; and 3) 5 were killed by the 1999-2000 JPB generation. The mean diameter of the total dead Jeffrey pine was 18.4 in. DBH (7.8 –30.1 in. DBH). Mean diameter of the 24 trees currently infested with JPB was 19.9 in. DBH (12.1-30.1 in. DBH). Three (13%) of the 24 trees currently infested with JPB had red turpentine beetle (*D. valens*) attacks at the base of the bole. The brood in the infested Jeffrey pine was predominantly in the larval stage. Parent adults were found active in egg galleries in two infested trees and a few pupae were observed in two other trees. One lightly pigmented next generation adult was found in a pupal chamber in one infested tree.

In addition, 18 Jeffrey pine were found with current top-kill or beginning fade of the entire crown without external evidence of Jeffrey pine beetle attack. Two of these trees were felled and examination revealed attack by the pine engravers, *Ips pini* and *I. emarginatus* (Coleoptera; Scolytidae). Pine engraver brood adults, pupae and some larvae were found under the bark of these trees. Exit holes were also present indicating some adult emergence had occurred. *Ips pini* was far more prevalent than *I. emarginatus* and no evidence of Jeffrey pine beetle attack was found on the felled trees. Five of the pine engraver infested pines had 100 percent of the crown showing signs of early fade. On the remaining 13 trees, top-kill/crown fade averaged 54 percent (20-95%) of the live crown, based on visual estimates. Mean diameter of pine engraver infested trees was 24.9 in. DBH (17.7-31.5 in. DBH). Eleven (61%) of the top-killed pines showed some degree of bark flaking by woodpeckers and four (22%) had current red turpentine beetle attacks at the base.

Suppression

Suppression involving removal of the 24 trees currently infested with JPB was implemented in October-November, 2001. All infested trees were removed by November 23, 2001. Infested portions of trees were moved from the campground and stored at a Forest Service gravel pit near Mammoth/Yosemite Airport until adult emergence was completed. The gravel pit is located approximately two air miles from the nearest Jeffrey pine stands. Emergence was finished on June 23, 2002.

Although technically not part of the JPB suppression project, all other dead and top-killed trees were removed from the campground as salvage to reduce hazard and risk to public health and safety. Sections of trees infested with pine engravers were also taken to the gravel pit.

Monitoring

Surveys will be conducted in the Sherwin Creek Campground treatment area in the fall of 2002 to detect any current JPB activity. As discussed below, annual surveys to detect Jeffrey pine infested with JPB should be a normal part of the work conducted in developed recreation and other high use sites where Jeffrey pine is a significant component of the vegetation.

Discussion

Examination of trees killed by JPB in and around Sherwin Creek Campground indicates the current outbreak of mortality started with five trees attacked in 1999. The mortality was not discovered until September of 2001 by which time 58 additional trees had been attacked in 2000 and 2001. Observations of Jeffrey pine beetle-related mortality dynamics over the past twenty-plus years on the Inyo National Forest and in the vicinity of Lake Tahoe suggest at least some JPB mortality groups expand in localized areas from a few to many trees over subsequent JPB generations. Dead and hazardous trees are routinely removed from developed recreation sites to protect public health and safety. Timely removal of JPB infested trees may prevent additional mortality in the vicinity of infested trees. Trees in campgrounds and other developed recreation sites are of very high value. In all such high value sites where Jeffrey pine is a major component of the vegetation, annual surveys to facilitate early detection and treatment (timely removal of infested trees) of JPB infestations, when the number of infested trees is relatively low, can reduce subsequent mortality and prevent unacceptable resource impacts.

The JPB is native to Jeffrey pine stands and is an integral part of Jeffrey pine stand dynamics. A number of factors can influence the relative susceptibility of Jeffrey pines to attack by JPB. Moisture stress, diseases, including root diseases and dwarf mistletoes, and overly dense stocking levels can weaken Jeffrey pine, increasing the likelihood of successful attack by JPB. In areas like campgrounds and other high use sites where it is usually beneficial to minimize tree mortality, such predisposing factors can be managed to reduce the potential for JPB attack. As noted above, the stocking levels in Sherwin Creek Campground are considerably above desired

levels and the judicious use of thinning could reduce stocking to levels less conducive to JPB attack.

Such actions are best implemented within the context of overall management plans for campgrounds and other developed sites. Such plans should include a vegetation management component. Silvicultural prescriptions developed for such vegetation management plans would include consideration of factors that affect tree susceptibility to bark beetle attack, such as stocking densities and diseases, as well as needs for revegetation, visual and physical screening and vegetative cover.

BIOLOGY

JEFFREY PINE BEETLE

Dendroctonus jeffreyi (Coleoptera: Scolytidae)

The Jeffrey pine beetle (JPB) is the principle bark beetle found attacking Jeffrey pine, *Pinus jeffreyi*, which is its only host. It is a native insect occurring throughout the range of Jeffrey pine from southwestern Oregon southward through California and western Nevada to northern Mexico. The beetle normally breeds in large, slow-growing, mature and/or stressed trees and under such conditions, mortality usually occurs as scattered, individual trees as opposed to large groups. Under outbreak conditions, often triggered by drought or other factors that weaken trees and predispose them to JPB attack, pines with diameters greater than 6 inches DBH are attacked. Mortality under these conditions often occurs in large groups of from 30 to 100 or more trees. The JPB is not known to successfully breed in slash.

The JPB usually completes one generation per year in the northern part of its range but may complete two generations in the south. Adults generally fly and attack between late-May/early-June and early-October. The adults are cylindrical, reddish-brown to black, and are about 5/16 inch in length. Upon successfully attacking a Jeffrey pine, usually in the mid to lower bole, adult JPB excavate a longitudinal egg gallery in the cambium/inner bark which often has a distinctive "J" shaped segment at the bottom. Eggs are laid in niches along the sides of egg galleries which are packed with frass. After hatch, larvae feed in mines perpendicular to the egg gallery and end in open, oval-shaped pupal cells in which pupation occurs. The JPB tends to overwinter as larvae and adults.

Jeffrey pine attacked by JPB can be identified by reddish pitch tubes on the bole where adults have attacked and/or brownish to reddish frass (boring dust) that collects in bark crevices and at the base of the tree. Attacked trees also exhibit a sequence of crown fade from greenish yellow to reddish brown. Depending on when trees are attacked and other factors, crowns often do not begin to fade until spring or early summer of the year following attack.

Several other organisms are often associated with JPB attacks. Bluestain fungi, yeasts, and other fungi are transferred into the tree by attacking adults. The California flatheaded borer, *Melanophila californica*, the pine engraver, *Ips pini*, and the emarginate ips, *I. emarginatus*, may be found in JPB attacked trees. The red turpentine beetle, *Dendroctonus valens* , often attacks the base of JPB-infested pines.